Sleep Medicine 15 (2014) 1025–1030

Contents lists available at ScienceDirect

Sleep Medicine

journal homepage: www.elsevier.com/locate/sleep

Original Article

Job stress, burnout, and job satisfaction in sleep apnea patients

Ottavia Guglielmi [a,*], Bernabé Jurado-Gámez [b,c], Francisco Gude [d], Gualberto Buela-Casal [a]

[a] Sleep Unit, Mind, Brain and Behavior Research Center (CIMCYC), University of Granada, Granada, Spain
[b] Sleep Unit, Department of Respiratory Medicine, Reina Sofia University Hospital, Cordoba, Spain
[c] Instituto Maimónides de Investigación Biomédica de Cordoba (IMIBIC), Cordoba, Spain
[d] Clinical Epidemiology Unit, University Hospital of Santiago de Compostela, Santiago de Compostela, Spain

ARTICLE INFO

Article history:
Received 27 January 2014
Received in revised form 2 April 2014
Accepted 5 May 2014
Available online 11 June 2014

Keywords:
Obstructive sleep apnea syndrome
Job stress
Burnout
Job satisfaction
Sleep apnea
Occupational health

ABSTRACT

Objective: To assess job stress, burnout, and job satisfaction in patients with obstructive sleep apnea syndrome (OSAS).
Methods: A total of 182 patients with OSAS and 71 healthy individuals completed the Job Content Questionnaire, the Maslach Burnout Inventory – General Survey, the Index of Job Satisfaction, the Epworth Sleepiness Scale, and the Pittsburgh Sleep Quality Index. All participants were assessed with full-night polysomnography.
Results: Survey scores of patients diagnosed with OSAS only differed from those of the control group in the emotional exhaustion dimension ($P = 0.015$). According to a multivariate analysis, the apnea–hypopnea index (AHI) was only correlated with perceived support at work (β coefficient = 0.142; $P = 0.048$). Associations were found between subjective sleep quality, perceived support from coworkers, and supervisors (β = 0.157; $P = 0.025$), psychological demands (β = 0.226; $P = 0.001$), emotional exhaustion (β = 0,405; $P = 0.000$), and cynicism (β = 0.224; $P = 0.002$). The study also revealed associations between excessive daytime sleepiness and the burnout dimensions emotional exhaustion (β = 0.232; $P = 0.000$) and cynicism (β = 0.139; $P = 0.048$).
Conclusion: Objective parameters of OSAS such as the AHI seem to have limited influence on the psychosocial aspects of the occupational life of patients with OSAS. There is evidence of significant associations between the subjective symptoms of the disease, such as daytime sleepiness, subjective sleep quality, job stress, and burnout.

1. Introduction

Obstructive sleep apnea syndrome (OSAS) is a chronic breathing disorder characterized by repeated episodes of limited air flow during individuals' sleep that lead to a decrease in nocturnal oxygen saturation and micro-awakenings [1]. In western societies, this syndrome has a prevalence of 24% in middle-aged men and 9% in middle-aged women [2], and is associated with the development of hypertension, cardiovascular and cerebrovascular disorders and abnormalities in glucose metabolism [3].

OSAS has a variety of symptoms such as snoring, apneas reported by the bed partner, frequent awakenings and sleep agitation and fragmentation. Patients with OSAS experience fatigue and the feeling of having had non-restorative sleep. They often report morning headaches, mood changes (e.g. depression and anxiety [4,5]), cognitive difficulties (e.g. loss of short-term memory and longer reaction times [6,7]), and sexual problems [8].

Most of the functional difficulties reported by patients with OSAS are secondary to excessive daytime sleepiness (EDS), which is the symptom with the greatest impact of patients' everyday life [9]. Due to EDS and its above-mentioned repercussions on patients' physical and cognitive function, such patients have a greater number of traffic accidents [10] and accidents at the workplace [11]. People diagnosed with OSAS or who exhibit symptoms of this disease have been found to have higher levels of absenteeism and work disability compared with controls [12], and EDS is often the most important factor determining the high prevalence of sick leave and the productivity decrease observed in such patients [13–15].

Some authors have explored the relationship between sleep disorders, job stress, and burnout syndrome. Workers who have a sleep disorder such as insomnia or OSAS have reported higher job stress compared with that of healthy individuals [16]. Åkerstedt et al. [17] argue that sleep may be involved in the development of burnout, as individuals with symptoms of burnout also report sleep fragmentation. People with high levels of burnout syndrome are

* Corresponding author at: Sleep unit, Brain and Behavior Research Centre (CIMCYC), Campus de Cartuja s/n, Universidad de Granada, 18011 Granada, Spain. Tel.: +34 615 944 645; fax: +34 958 16 17 08.
E-mail address: ottavia@ugr.es (O. Guglielmi).

http://dx.doi.org/10.1016/j.sleep.2014.05.015
1389-9457/

considered to have sleep characterized by low efficiency, high latency, a lower proportion of deep sleep, longer periods of wakefulness, poorer subjective sleep quality, and non-restorative sleep [18].

As regards aspects related to psychosocial occupational health, the authors of the present study found very few publications on stress, burnout and job satisfaction in patients with OSAS. The scientific evidence found referred to other sleep disorders such as insomnia or daytime sleepiness. Such evidence suggests that, compared with healthy individuals, patients with OSAS may also be exposed to a higher risk of experiencing psychosocial difficulties at work. Indeed, patients with OSAS have a sleep disorder that causes fatigue, daytime sleepiness and sleep fragmentation, thus preventing them from getting proper rest and recovering from fatigue. As a result, they may have a high risk of experiencing psychological difficulties and emotional distress at work. Considering this, we designed an ex-post-facto study to explore the relationship between the presence of a diagnosis of OSAS and its main symptoms (i.e. excessive daytime sleepiness and poor subjective sleep quality) and job stress, burnout and job satisfaction. This study was performed following Hartley's recommendations [19].

2. Methods

A total of 253 consecutive patients from two sleep units (Centro de Saude de Val Miñor, Pontevedra, and Hospital Universitario Reina Sofia, Cordoba, in northern and southern Spain, respectively) were included in this study. All subjects were suspected of having OSAS because of the daytime hypersomnolence, loud snoring, nocturnal choking, and awakenings or apneic events (or all four) reported by the subject or a bedmate. The sample was composed of 204 men and 49 women aged between 22 and 65 years. Mean age was 46.85 ± 9.50 years. The clinical group included 182 patients diagnosed with OSAS and the control group included 71 individuals without OSAS. We only selected individuals who were employed – or had been unemployed for a maximum of six months – at the time of the survey, were willing to cooperate, and gave signed informed consent. Exclusion criteria included a diagnosis of any other sleep disorders or serious limiting diseases, addiction to alcohol or other drugs and treatment with neuroleptic drugs, tranquillizers or other drugs that may cause sleep alterations or excessive daytime sleepiness.

At both medical centers, data on patients' demographic characteristics, sleep and medical history, medication use and habits were obtained between 2010 and 2012 with the use of a standardized questionnaire administered before the start of overnight polysomnography (PSG). All participants were assessed with full-night PSG for the diagnosis of OSAS. The PSG included three electroencephalogram (EEG) channels (F4–M1, C4–M1 and O2–M1), two electro-oculogram (EOG) channels, two chin and two tibial electromyogram (EMG) channels, and one electrocardiogram (ECG) channel. Peripheral oxygen saturation (SaO_2), heart rate, and snoring frequency were recorded. Air flow was measured with a nasal cannula and thermistor. Thoracic and abdominal effort was measured with elastic bands. Sleep studies were manually reviewed by specialized professionals following the recommendations of the American Academy of Sleep Medicine [20]. Apnea was defined as continuous cessation of airflow for >10 s, and hypopnea was defined as a reduction in airflow for >10 s with oxygen desaturation ≥3%. The apnea–hypopnea index (AHI) was calculated as the total number of episodes of apnea and hypopnea per hour of sleep. The exposure group was previously defined as having AHI ≥ 5 (i.e. five or more events per hour of sleep); the control group was composed of patients with an AHI < 5. The method and diagnostic criteria used were the same in the two medical centers.

Before going to bed for the sleep study, all participants completed a questionnaire aimed at obtaining general information, such as socio-demographic data, previous diseases, medication use, use of stimulants, type of job, and job characteristics (e.g. schedule, number of hours of work, shifts, and type of job contract). Data on education level were organized into five categories (i.e. no education, primary education, secondary education, vocational training, college education). Jobs were classified into 10 groups of occupations following the International Standard Classification of Occupations (ISCO-08) [21].

The presence of excessive daytime sleepiness was assessed with the Epworth Sleepiness Scale (ESS) [22,23] and subjective sleep quality was evaluated with the Pittsburgh Sleep Quality Index (PSQI) [24,25]. Job stress was assessed with the Job Content Questionnaire (JCQ) [26,27]. This questionnaire is composed of 22 items that refer to three subscales: psychological demands (six items), job support (nine items), and job control (seven items). Responses range from 1 (strongly disagree) to 4 (strongly agree). The three dimensions have good internal consistency, with Cronbach's $\alpha > 0.70$.

Burnout was assessed with the Maslach Burnout Inventory – General Survey (MBI-GS) [28], Spanish adaptation by Gil-Monte [29]. This version of the questionnaire has 16 items which, as pointed out in the manual, are distributed into three subscales: professional efficacy (six items), emotional exhaustion (five items), and cynicism (five items). Subjects rate each item of the questionnaire on a Likert scale in which they indicate the frequency with which they have experienced the situation described in the item. This frequency scale has seven levels ranging from 0 (never) to 6 (every day). The subscales had the following reliability values, measured with Cronbach's α: 0.85 for professional efficiency, 0.83 for emotional exhaustion, and 0.74 for cynicism.

Participants' job satisfaction was measured with the Index of Job Satisfaction, Spanish adaptation by Ortega and Martín [30,31]. This instrument is composed of 19 items that assess various aspects of job satisfaction: task significance, positive motivation, negative motivation, satisfaction with the task, and job suitability. It is also possible to obtain a total score of job satisfaction by adding up the scores of each item. Items are rated on a six-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The instrument has high internal consistency, with Cronbach's α of 0.93.

The characteristics of the sample were expressed in means and standard deviations for quantitative variables and in percentages and absolute numbers for qualitative variables. Student's *t*-test was used to compare job stress, burnout, and job satisfaction between the clinical group and the control group. A linear regression model was used to analyze the influence of objective and subjective variables along with the presence of OSAS on job stress, burnout, and job satisfaction.

The project was approved by the clinical research ethics committees of the medical centers that participated in the study. Participation in the study was totally voluntary. Subjects were duly informed of the objectives of the research and gave signed informed consent.

3. Results

Table 1 shows the main socio-demographic and health characteristics of the sample, divided into the clinical group and the control group. The two groups did not differ in age or education level but differed in sex ratio, body mass index, and job type. Both samples were similar as regards comorbidities, except for the presence of hypertension, which was significantly more prevalent in patients with OSAS compared with healthy individuals.

Table 2 includes data on the presence of physical stressors at work, symptoms of somatization of stress, subjective sleep quality, excessive daytime sleepiness, and objective sleep variables obtained with the polysomnography. Both samples differed

Table 1
Socio-demographic and clinical characteristics of participants in the OSAS and non-OSAS groups.

Characteristics	Patients with OSAS ($n = 182$)	Non-OSAS subjects ($n = 71$)	*P*-value
Age (years)	47.3 (9.05)	45.7 (10.53)	0.263
Sex			0.000
Women	13.8% (25)	33.3% (24)	
Men	86.2% (157)	66.7% (47)	
Body mass index (kg/m^2)	30.5 (5.40)	26.9 (4.58)	0.000
Education			0.405
No education	2.8% (5)	2.8% (2)	
Primary education	30.4% (55)	28.2% (20)	
Secondary education	23.2% (42)	21.1% (15)	
Vocational training	23.8% (43)	16.9% (12)	
College education	19.9% (36)	31% (22)	
Job type			0.009
Directive personnel	0	0	
Scientific and intellectual professionals	5.7% (10)	20.3% (14)	
Mid-level technicians and professionals	16.1% (28)	11.6% (8)	
Office employees	0.6% (1)	0	
Workers in services	18.4% (32)	21.7% (15)	
Farmers/fishermen	3.4% (6)	0	
Officials, operators and artisans	1.7% (3)	0	
Operators of installations	40.8% (71)	29% (20)	
Non-specialized workers	9.2% (16)	15.9% (11)	
Armed forces	4.0% (7)	1.4% (1)	
Alcohol (% high consumption)	10.4% (19)	8.5% (6)	0.595
Tobacco (% high consumption)	15.6% (28)	12.7% (9)	0.120
Comorbidities			
Hypertension	27.5% (50)	14.1% (10)	0.024
Diabetes	6.6% (12)	4.2% (3)	0.474
Hypercholesterolemia	28% (51)	26.8% (19)	0.840
Cardiovascular disease	5.5% (10)	4.2% (3)	0.681
Pulmonary disease	3.8% (7)	8.5% (6)	0.136
Endocrine disease	4.9% (9)	7% (5)	0.512
Neurological disease	2.8% (5)	4.2% (3)	0.551
Medication use (% habitual drug users)	53.9% (97)	45.1% (32)	0.208

Abbreviations: OSAS, obstructive sleep apnea syndrome; alcohol (% high consumption), ≥36 g of alcohol per day; tobacco (% high consumption), >20 cigarettes per day.
Data expressed as percentage and absolute number for qualitative variables, and as mean and standard deviation for quantitative variables.

regarding EDS but had similar values regarding subjective sleep quality, presence of physical stressors at work and symptoms of somatization of stress. Significant differences between the clinical group and the control group were found in all the target respiratory and sleep indices except for sleep efficiency.

As regards psychosocial occupational health (Table 3), the clinical group and the control group had similar scores in job stress, burnout, and job satisfaction. The clinical group reported higher levels of emotional exhaustion than the control group. We compared the psychosocial occupational health scores of participants who reported EDS (ESS > 10) to those of participants who did not report EDS and found significant differences in the job stress component (i.e. perceived job support) and in the burnout components emotional exhaustion and cynicism. As regards job satisfaction, scores were similar in both groups. We also compared the psychosocial occupational health of participants with poor subjective sleep quality (PSQI > 5) to that of participants who reported good sleep quality. There were significant differences in the burnout components emotional exhaustion and cynicism, and in job satisfaction.

The influence of variables related to the subjective symptoms of OSAS on the psychosocial occupational health of patients with OSAS was assessed through multivariate analysis (Table 4).

4. Discussion

The present study revealed that, even though the clinical group reported higher levels of emotional exhaustion than the control group, patients with OSAS did not exhibit higher levels of job stress or job dissatisfaction compared with the group of healthy individuals. The AHI was only correlated with perceived job support from coworkers and supervisors. However, the presence of the main

Table 2
Subjective and objective characteristics related to OSAS and work of participants in the OSAS and control groups.

Characteristics	Patients with OSAS ($n = 182$)	Non-OSAS subjects ($n = 71$)	*P*-value
Physical stressors at work (%)	60.7	57.1	0.608
Symptoms of somatization of stress (%)	33.6	22.5	0.095
Excessive daytime sleepiness (ESS)	10.3 (5.30)	8.5 (4.70)	0.021
Subjective sleep quality (PSQI)	7.9 (3.90)	7.3 (3.72)	0.238
Mean SaO_2 (%)	92.6 (2.85)	95.2 (1.64)	0.000
T_{90} (%)	12.9 (19.20)	1.06 (3.33)	0.000
AHI (events/h)	42.6 (28.38)	2.1 (1.73)	0.000
Total sleep time (min)	271.7 (68.23)	338.68 (67.99)	0.000
Sleep efficiency (%)	84.5 (12.33)	86.3 (9.95)	0.276

Abbreviations: OSAS, obstructive sleep apnea syndrome; ESS, Epworth Sleepiness Scale; PSQI, Pittsburgh Sleep Quality Index; SaO_2, arterial oxygen saturation; T_{90}, sleep time spent with SaO_2 <90%; AHI, apnea–hypopnea index.
Data expressed as percentage and absolute number for qualitative variables, and as mean and standard deviation for quantitative variables.

Table 3
Work stress, burnout, and job satisfaction of participants with and without obstructive sleep apnea syndrome, diurnal hypersomnolence, and quality of sleep.

Occupational health	OSAS diagnosis			Diurnal hypersomnolence			Quality of sleep		
	Non-OSAS (n = 71)	OSAS (n = 182)	P-value	EDS <10 (n = 107)	EDS ≥10 (n = 129)	P-value	PSQI <5 (n = 48)	PSQI ≥5 (n = 175)	P-value
Work stress									
Psychological demands	16.4 (3.5)	16.9 (3.5)	0.287	16.5 (3.4)	17.1 (3.6)	0.204	16.6 (2.6)	16.8 (3.7)	0.693
Job support	25.6 (4.6)	26.1 (5.6)	0.508	26.9 (4.5)	25.1 (5.8)	0.010	26.7 (5.5)	26.0 (5.1)	0.438
Job control	20.4 (3.9)	21.4 (4.6)	0.104	21.3 (4.2)	21.0 (4.4)	0.608	22.1 (3.6)	20.7 (4.5)	0.058
Burnout									
Professional efficacy	29.1 (5.4)	30.0 (6.7)	0.251	30.2 (6.4)	29.2 (6.3)	0.254	31.2 (5.7)	29.5 (6.3)	0.089
Emotional exhaustion	10.6 (7.5)	13.4 (8.5)	0.015	9.3 (7.6)	15.0 (8.0)	0.000	7.8 (6.3)	14.0 (8.3)	0.000
Cynicism	9.4 (6.5)	9.0 (6.9)	0.692	7.7 (5.5)	10.0 (7.3)	0.002	7.3 (6.0)	9.5 (6.7)	0.049
Job satisfaction	64.4 (10.8)	66.9 (11.5)	0.113	67.9 (10.5)	65.0 (11.0)	0.052	69.1 (10.2)	65.3 (11.5)	0.043

Abbreviations: OSAS, obstructive sleep apnea syndrome; EDS, excessive daytime sleepiness; PSQI, Pittsburgh Sleep Quality Index.
Data are expressed as mean (standard deviation).

Table 4
Multivariate linear regression analysis of the influence of obstructive sleep apnea syndrome-related variables on psychosocial occupational health.

Occupational health	Variables inserted into the model	Adjusted R	F	β
Job stress				
Support		0.027	2.905*	
	Sex			0.319
	PSQI			–0.157*
	AHI			0.142*
Demands		0.044	4.415**	
	Age			–0.071
	Sex			–0.072
	PSQI			0.226**
Control		0.085	6.014**	
	Sex			–0.191**
	PSQI			–0.099
	BMI			–0.224**
	Mean SaO_2			–0.128
Burnout				
Professional efficacy		0.019	3.283*	
	Sex			–0.100
	BMI			–0.143*
Emotional exhaustion		0.281	16.93**	
	Sex			0.056
	Age			–0.099
	BMI			0.027
	PSQI			0.405**
	ESS			0.238**
Cynicism		0.078	9.64**	
	PSQI			0.224**
	ESS			0.139*
Job satisfaction		0.035	4.782**	
	PSQI			–0.135
	ESS			–0.128

Abbreviations: PSQI, Pittsburgh Sleep Quality Index; AHI, apnea–hypopnea index; SaO_2, arterial oxygen saturation; BMI, body mass index; ESS, Epworth Sleepiness Scale.
* $P < 0.05$; ** $P < 0.01$.

subjective symptoms of OSAS (i.e. EDS and poor subjective sleep quality) influenced psychosocial occupational health, particularly job stress and burnout.

Patients with OSAS reported higher levels of emotional exhaustion, an important element to diagnose the presence of burnout syndrome. Results of this study confirm some findings of previous studies. In a broad sample of workers, Rajaratnam et al. [32] assessed the burnout levels of individuals who had shown symptoms of OSAS in their responses to the Berlin Questionnaire: workers with symptoms of OSAS reported higher levels of exhaustion and depersonalization compared with participants without symptoms of OSAS.

In this study there were correlations between the AHI and perceived support from coworkers and supervisors. In the study conducted by Nakata et al. [33], workers with a high level of job stress were found to be more likely to have respiratory sleep disorders. However, OSAS was assessed using a single question, which is not very reliable and may have led to some bias in the classification of the disorder.

The present study revealed that, rather than the diagnosis of OSAS, the determining factors of perceived job stress and burnout were the presence of EDS and poor sleep quality. The scientific literature has yielded evidence of associations between psychosocial occupational health, sleepiness, and other sleep disorders. Several studies exploring the relationship between occupational health and sleep quality have revealed multiple associations between workplace tension, characterized by situations involving high psychological demands and low job control [34], intergroup conflict [35], job dissatisfaction and job difficulty [36], and insomnia. Keklund et al. [37] reported that apprehension of the subsequent working day was

reflected in a decrease in slow wave sleep, an increase in light sleep, and poor subjective sleep quality. According to Geurtz and Sonnentag [38], exposure to long-term job stress and insufficient rest can affect individuals' health and cause diseases such as cardiovascular or musculoskeletal disorders, depression or burnout. Other authors have argued that sleep disorders may be the underlying mechanism for the onset of burnout symptoms. They argue that the lack of adequate rest leads to depletion of the energy reserves of individuals exposed to chronic job stress [39]. According to these authors, long-term exposure to job stress, non-restorative sleep, and decreased ability to recover from fatigue lead to a vicious circle that eventually affects the function of the hypothalamic–pituitary–adrenal axis [40].

Our study provided evidence of several associations between poor subjective sleep quality, high psychological demands, and low support from coworkers and supervisors. These results confirm the findings of several studies. For example, Grossi et al. [41] observed that women with high burnout scores also reported stressful situations at work [and sleep problems like low subjective sleep quality, high number of awakenings and excessive daytime sleepiness]. According to Doi et al. [42], psychological stress at work and low job satisfaction are related to low sleep quality. Kageyama et al. [43] compared perceived job stress in subjects with good and poor sleep quality, finding that people who did not rest well reported greater difficulties at work and less support. De Lange et al. [44] found that high demands and low job control were related to sleep disorders and that job stress affected individuals' well-being and their ability to recover from fatigue.

In this study a strong association was found between poor sleep quality, excessive daytime sleepiness of participants, and burnout, particularly in the emotional exhaustion and cynicism subscales. Ekstedt et al. [18] obtained similar results when comparing young workers with low and high levels of burnout. In a group of doctors, Vela-Bueno et al. [45] observed that those who reported higher burnout rates also reported poor subjective sleep quality and several symptoms of insomnia. Södeström et al. [46] assessed participants with different levels of burnout and found that the sleep quality of those with high burnout rates differed from that of participants without this syndrome in that the former were not able to recover from fatigue through sleep and also reported sleepiness during rest days.

As regards job satisfaction, the present study only showed an association between self-reported sleep quality and low job satisfaction. No relationship was found between low job satisfaction and excessive daytime sleepiness. In a classic study by Lavie et al. [47], workers who reported high levels of sleepiness also reported lower job satisfaction. This finding was also confirmed by the study conducted by Doi et al. [42]. Yet, Nishitani et al.'s [36] findings were similar to those of the present study, as poor sleepers reported lower job satisfaction.

To the best of our knowledge, the present study is one of the first in which validated questionnaires have been used to explore the occupational health of patients with OSAS diagnosed using PSG, a reference test in sleep studies. However, one limitation is that it is a cross-sectional descriptive study and therefore no causal inferences can be made between the variables studied.

In conclusion, we found evidence of an association between the subjective symptoms of OSAS (i.e. excessive daytime sleepiness and subjective sleep quality) and job stress and burnout. However, the objective parameters of this disease (e.g. number of respiratory disturbances) seem to have a limited influence on these psychosocial aspects of occupational life.

Funding sources

His study was made possible thanks to a grant for the training of teaching and research staff provided by the Regional Government of the region of Andalucia, Spain to the Department of Personality, Evaluation and Psychological Treatment, Faculty of Psychology, University of Granada.

Conflict of interest

None declared.

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: http://dx.doi.org/10.1016/j.sleep.2014.05.015.

References

[1] Lloberes P, Durán-Cantolla J, Martínez-García MA, Marín JM, Ferrer A, Corral J, et al. Diagnosis and treatment of sleep apnea–hypopnea syndrome. Spanish Society of Pulmonology and Thoracic Surgery. Arch Bronconeumol 2011;47:143–56.
[2] Young T, Palta M, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. N Engl J Med 1993;328:1230–5.
[3] McArdle N, Hillman D, Beilin L, Watts G. Metabolic risk factors for vascular diseases in obstructive sleep apnea: a matched controlled study. Am J Respir Crit Care Med 2007;175:190–5.
[4] Bardwell WA, Moore P, Ancoli-Israel S, Dimsdale JE. Fatigue in obstructive sleep apnea: driven by depressive symptoms instead of apnea severity? Am J Psychiatry 2003;160:350–5.
[5] Guglielmi O, Sánchez AI, Jurado-Gámez B, Buela-Casal G, Bardwell WA. Obesity and sleep quality: the predictors of depression and anxiety in obstructive sleep apnea syndrome patients. Rev Neurol 2011;52:515–21.
[6] Sánchez AI, Bermúdez MP, Buela-Casal G. Evaluación de la memoria a corto plazo en pacientes con apnea del sueño antes y después del tratamiento con CPAP. Salud Ment 2003;26:55–61.
[7] Sánchez AI, Martínez P, Miró E, Bardwell WA, Buela-Casal G. CPAP and behavioral therapies in patients with obstructive sleep apnea: effects on daytime sleepiness, mood, and cognitive function. Sleep Med Rev 2009;13:223–33.
[8] Gonçalves MA, Guilleminault C, Ramos E, Palha A, Paiva T. Erectile dysfunction, obstructive sleep apnea syndrome and nasal CPAP treatment. Sleep Med 2005;6:333–9.
[9] Guglielmi O, Sánchez AI, Jurado-Gámez B, Buela-Casal G. Efectos del Síndrome de Apneas-Hipopneas del Sueño sobre la calidad de vida y la somnolencia diurna. Univer Psychol 2013;12:601–11.
[10] Philip P, Sagaspe P, Lagarde E, Leger D, Ohayon MM, Bioulac B, et al. Sleep disorders and accidental risk in a large group of regular registered highway drivers. Sleep Med 2010;11:973–9.
[11] Ulfberg J, Carter N, Edling C. Sleep-disordered breathing and occupational accidents. Scand J Work Environ Health 2000;26:237–42.
[12] Sjösten N, Kivimäki M, Oksanen T, Salo P, Saaresranta T, Virtanen M, et al. Obstructive sleep apnoea syndrome as a predictor of work disability. Respir Med 2009;103:1047–55.
[13] Sivertsen B, Overland S, Glozier N, Bjorvatn B, Maeland JG, Mykletun A. The effect of OSAS on sick leave and work disability. Eur Respir J 2008;32:1497–503.
[14] Sivertsen B, Björnsdottir E, Øverland S, Bjorvatn B, Salo P. The joint contribution of insomnia and obstructive sleep apnoea on sickness absence. J Sleep Res 2013;22:223–30.
[15] Swanson LM, Arnedt JT, Rosekind MR, Bolenky G, Balkin TJ, Drake C. Sleep disorders and work performance: findings from the 2008 National Sleep Foundation Sleep in America poll. J Sleep Res 2011;20:487–94.
[16] Kim HC, Kim BK, Min KB, Min JY, Hwang SH, Park SG. Association between job stress and insomnia in Korean workers. J Occup Health 2011;53:164–74.
[17] Åkersted T, Kecklund G, Gillberg M. Sleep and sleepiness in relation to stress and displaced work hours. Physiol Behav 2007;92:250–5.
[18] Ekstedt M, Södeström M, Åkerstedt T, Nilsson J, Søndergaard HP, Aleksander P. Disturbed sleep and fatigue in occupational burnout. Scand J Work Environ Health 2006;32:121–31.
[19] Hartley J. New ways of making academic articles easier to read. Int J Clin Health Psychol 2012;12:143–60.
[20] Iber C, Ancoli-Israel S, Chesson AL, Quan SF, for the American Academy of Sleep Medicine. The AASM manual for the scoring of sleep and associated events: rules, terminology and technical specifications. 1st ed. Westchester, IL: AASM; 2007.
[21] ILO. Resolución sobre la actualización de la Clasificación Internacional Uniforme de Ocupaciones (CIUO-08). 17ª Conferencia Internacional de Estadísticos del Trabajo, [Resolution on the update of the International Standard Classification of Occupations (ISCO-08). 17th International Conference of Labour Statisticians]. (2007). <http://www.ilo.org/public/spanish/bureau/stat/isco/docs/resol08.pdf> [accessed 13.07.05].
[22] Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep 1991;14:540–5.
[23] Chiner E, Arriero JM, Signes-Costa J, Marco J, Fuentes I. Validation of the Spanish version of the Epworth Sleepiness Scale in patients with a sleep apnea syndrome. Arch Bronconeumol 1999;35:422–7.

[24] Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28:193–213.
[25] Royuela A, Macías JA. Clinimetrical properties of the Spanish version of the Pittsburgh questionnaire. Vigilia-Sueño 1997;9:81–94.
[26] Karasek RA, Brisson C, Kawakami N, Houtman I, Bougers P, Amick B. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. J Occup Health Psychol 1998;3:322–55.
[27] Escribà-Agüir V, Más Pons R, Flores Reus E. Validation of the Job Content Questionnaire in hospital nursing staff. Gac Sanit 2001;15:142–9.
[28] Schaufeli WB, Leiter MP, Maslach C, Jackson SE. Maslach Burnout Inventory – general survey. In: Maslach C, Jackson SE, Leiter MP, editors. The Maslach Burnout Inventory test manual. Palo Alto, CA: Consulting Psychologists Press; 1996. p. 19–26.
[29] Gil-Monte PR. Factorial validity of the Spanish adaptation of the Maslach Burnout Inventory – general survey. Salud Publica Mex 2002;44:33–40.
[30] Brayfield AH, Rothe HF. An index of job satisfaction. J Appl Psychol 1951;35:307–11.
[31] Ortega Leyva V, Martín Quirós MA. Adaptación al Castellano del index of job satisfaction de Brayfield and Rothe. Encuentros Psicol Soc 2003;1:12–15.
[32] Rajaratnam SMW, Barger LK, Lockley SW, Shea SA, Wang W, Landrigan CP, et al. Sleep disorders, health, and safety in police officers. JAMA 2011;306:2567–78.
[33] Nakata A, Takahashi M, Ikeda T, Haratani T, Hojou M, Araki S. Perceived job stress and sleep-related breathing disturbance in Japanese male workers. Soc Sci Med 2007;64:2520–32.
[34] Nomura K, Nakao M, Takeuchi T, Yano E. Association of insomnia with job strain, control, and support among male Japanese workers. Sleep Med 2009;10:626–9.
[35] Nakata A, Haratani T, Takahashi M, Kawakami N, Arito H, Kobayashi F, et al. Job stress, social support, and prevalence of insomnia in a population of Japanese daytime workers. Soc Sci Med 2004;59:1719–30.
[36] Nishitani N, Sakakibara H. Job stress factors, stress response, and social support in association with insomnia of Japanese male workers. Ind Health 2010;48:178–84.
[37] Keklund G, Åkerstedt T. Apprehension of the subsequent working day is associated with a low amount of slow wave sleep. Biol Psychol 2004;66:169–76.
[38] Geurtz SA, Sonnentag S. Recovery as an explanatory mechanism in the relation between acute stress reactions and chronic health impairment. Scand J Work Environ Health 2006;32:482–92.
[39] Toker S, Shirom A, Shapira I, Berliner S, Melamed S. The association between burnout, depression, anxiety and inflammation biomarkers: C-reactive protein and fibrinogen in men and women. J Occup Health Psychol 2005;10:344–62.
[40] Melamed S, Shirom A, Toker S, Berliner S, Shapira I. Burnout and risk of cardiovascular disease: evidence, possible causal paths, and promising research directions. Psychol Bull 2006;132:327–53.
[41] Grossi G, Perski A, Evengård B, Blomkvist V, Orth-Gomér K. Physiological correlates of burnout among women. J Psychosom Res 2003;55:309–16.
[42] Doi Y, Minowa M, Tango T. Impact and correlates of poor sleep quality in Japanese white-collar employees. Sleep 2003;26:467–71.
[43] Kageyama T, Nishikido N, Kobayashi T, Kurokawa Y, Kaneko T, Kabuto M. Self-reported sleep quality, job stress, and daytime autonomic activities assessed in terms of short-term heart rate variability among male white-collar workers. Ind Health 1998;36:263–72.
[44] De Lange AH, Kompier MA, Taris TW, Geurts SA, Beckers DG, Houtman IL, et al. A hard day's night: a longitudinal study on the relationships among job demands and job control, sleep quality and fatigue. J Sleep Res 2009;18:374–83.
[45] Vela-Bueno A, Moreno-Jiménez B, Rodríguez-Muñoz A, Olavarrieta-Bernardino S, Fernández-Mendoza J, De la Cruz-Troca JJ, et al. Insomnia and sleep quality among primary care physicians with low and high burnout levels. J Psychosom Res 2008;64:435–42.
[46] Södeström M, Ekstedt M, Åkerstedt T, Nilsson J, Axelsson J. Sleep and sleepiness in young individuals with high burnout scores. Sleep 2004;27:1369–77.
[47] Lavie P. Sleep habits and sleep disturbances in industrial workers in Israel: main findings and some characteristics of workers complaining of excessive daytime sleepiness. Sleep 1981;4:147–58.